

CLAIMS

1. A wavelength tunable distributed Bragg reflector (DBR) laser having optical waveguides surrounded by a clad layer on a substrate, comprising;
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a first passive region optical waveguide including a first DBR region having a diffraction grating in a section whose length corresponds to effective length of 95% or more in a saturated effective length value, wherein the lasing wavelength is controlled by a DBR control current,
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a second passive region optical waveguide including a second DBR region having a diffraction grating in a section whose length is shorter than the first DBR region, wherein the lasing wavelength is controlled by the DBR control current, and
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an active region optical waveguide in which the first passive region optical waveguide and the second passive region optical waveguide are optically connected at both ends, wherein emission state is controlled by the active region current, irrespective of the DBR control current.
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2. A wavelength tunable distributed Bragg reflector (DBR) laser according to Claim 1, wherein the first passive region optical waveguide includes a first electrical isolating region between the first DBR region and the active region optical waveguide, and the second passive region optical waveguide contains a second electrical isolating
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region between the second DBR region and the active region optical waveguide.

3. A wavelength tunable distributed Bragg reflector (DBR) laser according to Claim 1 and Claim 2, wherein an effective length of the second DBR region is 75% or less in the saturated effective length value.

4. A wavelength tunable distributed Bragg reflector (DBR) laser according to any one of Claim 1 through Claim 3, further comprising an anti-reflection film provided on an end face of the first passive region optical waveguide opposite the active region optical waveguide and an end face of the second passive region optical waveguide opposite the active region optical waveguide.

5. A wavelength tunable distributed Bragg reflector (DBR) laser having optical waveguides surrounded by a clad layer on a substrate, comprising;

20 a first passive region optical waveguide including a first DBR region having a diffraction grating in a section whose length corresponds to effective length of 75% or less in a saturated effective length value, wherein the lasing wavelength is controlled by a DBR control current,

25 a second passive region optical waveguide including a second DBR region having the diffraction grating in a section whose length corresponds to effective length of

75% or less in a saturated effective length value, wherein the lasing wavelength is controlled by the DBR control current,

an active region optical waveguide in which the first
5 passive region optical waveguide and the second passive region optical waveguide are optically connected at both ends, wherein emission state is controlled by the active region current, irrespective of the DBR control current,

a high-reflection film coating an end face of the first
10 passive region optical waveguide opposite the active region optical waveguide, and

an anti-reflection film coating an end face of the second passive region optical waveguide opposite the active region optical waveguide.

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6. A wavelength tunable distributed Bragg reflector (DBR) laser according to Claim 5, wherein the first passive region optical waveguide includes a first electrical isolating region between the first DBR region and the active
20 region optical waveguide, and the second passive region optical waveguide includes a second electrical isolating region between the second DBR region and the active region optical waveguide.

25 7. A wavelength tunable distributed Bragg reflector (DBR) laser having optical waveguides surrounded by a clad layer on a substrate, comprising;

a passive region optical waveguide including a DBR region having a diffraction grating in a section whose length corresponds to effective length of 75% or less in a saturated effective length value, wherein the lasing wavelength is controlled by a DBR control current,

an active region optical waveguide which is optically connected to the passive region optical waveguide, wherein emission state is controlled by the active region current irrespective of the DBR control current,

an anti-reflection film coating an end face of the passive region optical waveguide opposite the active region optical waveguide, and

a high-reflection film coating an end face of the active region optical waveguide opposite the passive region optical waveguide.

8. A wavelength tunable distributed Bragg reflector (DBR) laser according to Claim 7, wherein the passive region optical waveguide includes an electrical isolating region between the DBR region and the active region optical waveguide.

9. A wavelength tunable distributed Bragg reflector (DBR) laser according to any one of Claim 1 through Claim 8, wherein the length of the active region optical waveguide is in a range from 30 μ m to 100 μ m.

10. An integrated wavelength tunable distributed Bragg reflector (DBR) laser, comprising;

a plurality of wavelength tunable distributed Bragg reflector (DBR) lasers according to any one of Claim 1 through
5 Claim 9, in which the plurality of wavelength tunable distributed Bragg reflector (DBR) lasers respectively have different pitches of the diffraction grating,

an optical coupler for coupling output lights from each of the plurality of wavelength tunable distributed
10 Bragg reflector (DBR) lasers to one port to output a coupled light, and

an optical semiconductor amplifier for adjusting the output level of the coupled light.

15 11. A wavelength tunable distributed Bragg reflector (DBR) laser according to any one of Claim 1 through Claim 10, wherein a ratio of the lasing wavelength shift quantity to the Bragg wavelength shift quantity is in a range from 0.9 to 1.1.